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ABSTRACT

A new Iowa Career Education Inventory was developed to be technically sound and responsive to career education objectives defined in the Articulation Guide for Career Education. Four levels of the inventory were developed to measure instructional objectives of stages in career development: (1) awareness represented concepts taught in kindergarten through grade three, measured in third grade; (2) accommodation represented concepts taught in grades four through six, measured in grade six; (3) exploration represented concepts taught in grades seven through nine, measured in grade nine; and (4) preparation represented concepts taught in grades ten through twelve, measured in grade twelve. Each level included seven content domains. Self, Interpersonal Relationships, and Self and Society focused on understanding the relationship between personal and affective characteristics and career development. Decision Making Skills, Economics, Occupational Knowledge, and Work Values and Attitudes focused on the cognitive components of career development. Field test data should be further analyzed to examine the impact of forming composite scores. This instrument should be useful in assessing the appropriateness and effectiveness of integrating career education concepts into classroom instruction for grades three to twelve. (DWH)

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Creating Continuous Career Development Scales for Grades 3-12

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Abstract

Super, Holland and others have offered frequent support for the concepts of career development for adolescents and young adults. Ginzberg and his colleagues have extended the theoretical framework for career development and occupational choice from childhood through maturity. Yet most instrument development in career education has focused on single-stage measures rather than attempting to link career development concepts for students at different stages in the process. This study is an empirical attempt to assess student performance continuous scales for grades 3, 6, 9 and 12 in each of seven career education content domains.

Rationale for the Iowa Inventory

Many states have urged schools to integrate career education concepts throughout the curriculum, but few states have offered as much practical guidance to help teachers do so as Iowa. A ten-year series of studies and demonstration projects has led to adaptation of Bailey and Stadt's (1973) "process approach" to career development. Among the many products of this long-term effort to document the Iowa Career Education Model (1973) was a K-14 Articulation Guide for Career Education (1978) which provided goals, instructional objectives and recommended activities integrating career education concepts and skills into each grade level and subject area.

The purpose of this study has been to develop, field test and norm a new Iowa Career Education Inventory responsive to these instructional objectives for the Career Education Division of the Iowa Department of Public Instruction (DPI). A primary goal has been to create measures which are both technically sound and fully responsive to the career education objectives defined in the K-14 Articulation Guide for Career Education. Although activities are proposed for each grade level, the project has focused on preparing measures for the later stages or transition grade levels for each phase of the model. Thus four levels of the Inventory have been developed; each attempts to measure the essential instructional objectives of a stage in career development. The stages are:

* Awareness, representing K-3 concents and measured in grade 3;
* Accommodation, representing grades 4-6 and measured in grade 6;
* Exploration, representing grades 7-9 and measured in grade 9; and
* Preparation, representing grades 10-12 and measured in grade 12.

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Each level of the Iowa Inventory includes seven content domains. Three focus on understanding the relationships between personal and affective characteristics and career development; they are labelled Self, Interpersonal Relationships and Self and Society. Four domains focus on cognitive components of career development and are labelled Decision Making Skills, Economics, Occupational Knowledge, and Work Values and Attitudes. Each domain was defined by identifying two major themes or strands within the instructional objectives spanning the four levels of the Iowa model. Figure 1 identifies the domains and strands which emerged during clarification of the measurement objectives for the Iowa Inventory.

Figure 1

Domains and Strands of the Iowa Career Education Inventory

Domains	Strands
Self (SF)	Interests and Feelings
	Mental and Physical Characteristics
Interpersonal Relationships (IR)	Interaction within Groups
	Interaction between Groups
Self and Society (SS)	Societal Roles and Expectations
	Social Change and Technology
Decision Making Skills (DM)	Setting and Achieving Goals
	Decision Making Strategies
Economics (EC)	Consumers and Producers
	Costs and Rewards of Work
Occupational Knowledge (OC)	World of Work Requirements (e.g., qualifications)
	World of Work Operations
Work Values and Attitudes (WV)	School and Work Behaviors
	Work Incentives

Instrument design began by looking at each content domain as an independent component of the Inventory. The need to develop a continuous scale spanning the levels required that each level consist of two types of items. First, each level had to include a set of items shared with the adjacent levels of the Inventory; second, each level included some items unique to Awareness, Accommodation, Exploration or Preparation. This led to the linking design illustrated in Figure 2.

Specifications for the length of each level of the Inventory emerged from this design as illustrated in Figure 3. This structure resulted in 16-item scales for each domain at the Awareness and Preparation levels, and 18-item scales for each domain at the Accommodation and Exploration levels. These specifications also allowed for some reduction in instrument length after analysis of Pilot and Field Test data from the Inventory in the event that some items had to be deleted from the final instruments.

Figure 2

IOWA CAREER EDUCATION INVENTORY — INSTRUMENT SPECIFICATIONS

LINKING DESIGN

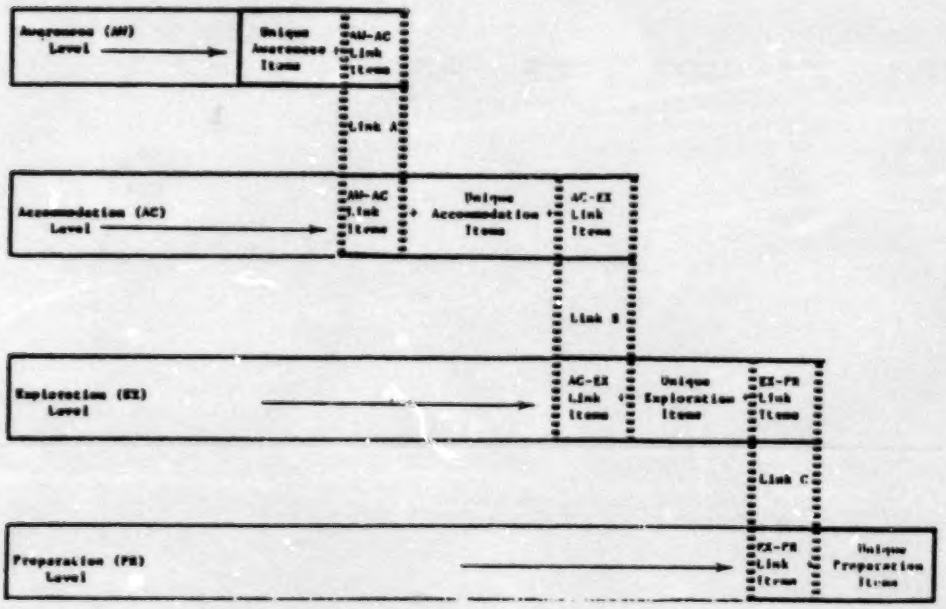

Figure 3

Pilot and Field Test Instrument Specifications for the
Iowa Career Education Inventory

Levels	Items per Strand	Total Instrument Length
Awareness (AW)	5 unique AW items/strand	70 unique AW items
	3 AW-AC link items/strand	42 AW-AC link items
	8 items/strand	112 items
Accommodation (AC)	3 AW-AC link items/strand	42 AW-AC link items
	3 unique AC items/strand	42 unique AC items
	3 AC-EX link items/strand	42 AC-EX link items
	9 items/strand	126 items
Exploration (EX)	3 AC-EX link items/strand	42 AC-EX link items
	3 unique EX items/strand	42 unique EX items
	3 EX-PR link items/strand	42 EX-PR link items
	9 items/strand	126 items
Preparation (PR)	3 EX-PR link items/strand	42 EX-PR link items
	5 unique PR items/strand	70 unique PR items
	8 items/strand	112 items
Summary		
Unique items	5 AW items/strand	70 unique AW items
	3 AC items/strand	42 unique AC items
	3 EX items/strand	42 unique EX items
	5 PR items/strand	70 unique PR items
Link items	3 AW-AC items/strand	42 AW-AC link items
	3 AC-EX items/strand	42 AC-EX link items
	3 EX-PR items/strand	42 EX-PR link items
	25 items/strand	350 items

Instrument Development and Pilot Administration Results

Pilot editions of each instrument were drafted and edited in the spring of 1981. Each book of items included seven strands, or half the total number of items for the level. Book 1 of each level consisted of the domains Interpersonal Relationships, Work Values, Occupational Knowledge, and the first strand of Self and Society. Book 2 included the domains Self, Decision Making, Economics, and the second strand of Self and Society. All 350 items were four-choice questions with a single correct response and three distractors.

Several steps were taken to monitor the sex-balance, reading levels and conceptual difficulty of the instruments. Figure 4 reports on the gender of the characters in the items. Neutral names such as Pat or Chris were used whenever possible, but efforts were made to avoid use of any single name too frequently within a single book of the Inventory. Each level was balanced to include the same number of male and female characters--both children and adults.

Fry Readability estimates (1977) also were applied to each Inventory book. Figure 5 reports the results of these analyses for the pilot administration edition; each book was at or below the grade level for which it was intended. Figure 5 also reports on the number of negatively phrased items in each book as a measure of the conceptual difficulty of the Inventory. Negatively framed items asked students to identify which of a set of factors did not meet the specified conditions or requirements for a concept. Such items typically rely on the key words "least", "not", or "except" in the question; such words always were capitalized to help students recognize that the item was stated differently.

Figure 4

Gender of Characters in Items of the Iowa Career Education Inventory

Level		Number of Items per Category				
		Male	Female	Neutral	None	Totals
Awareness	Book 1	19	20	5	13	56
	Book 2	21	20	4	11	56
Accommodation	Book 1	19	18	4	22	63
	Book 2	20	21	3	19	63
Exploration	Book 1	18	17	4	24	63
	Book 2	17	18	3	25	63
Preparation	Book 1	20	21	4	11	56
	Book 2	15	14	8	19	56

Figure 5

Reading Levels and Conceptual Difficulty of Items in the Iowa Inventory

Levels		Fry Readability Estimates	Negatively Phrased Items	
			Number	Percent
Awareness:	Book 1	Grade 3	3	5%
	Book 2	Grade 3	5	9%
Accommodation:	Book 1	Grade 3	6	10%
	Book 2	Grade 6	8	13%
Exploration:	Book 1	Grade 5	14	22%
	Book 2	Grade 9	13	21%
Preparation:	Book 1	Grade 6	12	21%
	Book 2	Grade 9	12	21%

An advisory panel of local teachers, counselors and administrators throughout Iowa has participated in each phase of instrument development. They reviewed and edited the initial drafts of the pilot administration edition of the Inventory, and the proposed changes in items following analysis of the pilot administration results. They have offered their recommendations and comments regarding instrument specifications, design, construction and administration of the measures to help assure that the Iowa Inventory is as responsive as possible to the career education activities proposed in the K-14 Articulation Guide for Career Education.

Field Test Administration and Results

More than 4,000 students participated in a state-wide field test of the revised Iowa Career Education Inventory in the fall of 1981. A stratified sample of school districts representing each major demographic and geographic region of the state was prepared. Public and non-public schools from 22 counties administered the instruments in 28 public school districts and 20 non-public schools.

Table 1 offers a statistical summary of the preliminary results of the field test. These data include all items, although item analyses indicate that some questions should be eliminated from the Inventory in the final form of the instruments. Separate item analyses have been compared for males vs. females, students in public vs. private schools, and students in urban vs. rural counties, in addition to the total sample analyses. Link items have been examined separately in each level in which they appear. Domain scores within each level have been used as the criterion variables for each set of analyses.

Table 1

Statistical Summary of Preliminary Field Test Results for the Iowa Career Education Inventory

	Sample Size	Average Score	S.D.	S.E.	Reliability	Average Rbis	Average Delta
Awareness	(16-item scales)						
SF	930	6.7	4.1	2.4	.67	.54	12.4
IR	945	7.1	3.2	2.4	.44	.44	12.4
SS	735	6.6	4.0	2.3	.67	.56	12.5
DM	930	7.8	4.5	2.3	.73	.59	11.9
EC	930	3.3	2.8	2.4	.27	.41	14.2
OC	945	6.6	3.9	2.3	.66	.55	13.0
WV	945	8.3	3.7	2.3	.63	.55	11.6
Accommodation	(18-item scales)						
SF	935	9.6	3.9	2.3	.65	.52	11.4
IR	985	9.1	3.6	2.5	.53	.47	11.5
SS	825	7.4	4.2	2.4	.67	.53	12.5
DM	935	9.7	4.9	2.4	.77	.61	11.3
EC	935	6.1	3.9	2.5	.58	.48	13.0
OC	985	6.9	3.9	2.4	.63	.51	12.8
WV	985	8.6	3.9	2.5	.62	.50	11.8
Exploration	(18-item scales)						
SF	985	10.8	3.8	2.3	.63	.51	10.8
IR	990	10.3	3.7	2.4	.55	.46	11.0
SS	795	7.3	3.8	2.5	.57	.47	12.5
DM	985	11.3	4.4	2.2	.75	.62	10.5
EC	985	5.9	3.6	2.6	.49	.44	13.1
OC	990	7.4	3.8	2.5	.55	.46	12.3
WV	990	10.8	3.9	2.4	.63	.50	10.8
Preparation	(16-item scales)						
SF	960	9.7	3.0	2.2	.47	.47	10.6
IR	1000	12.0	2.9	1.9	.57	.53	9.2
SS	870	8.5	3.7	2.2	.65	.54	11.4
DM	960	8.7	3.1	2.1	.55	.53	11.0
EC	960	3.8	2.9	2.4	.34	.41	14.0
OC	1000	6.2	3.2	2.4	.45	.45	12.7
WV	1000	10.8	3.2	2.0	.60	.55	9.9

Key

S.D. — Standard Deviation

S.E. — Standard Error

Average Rbis — Biserial correlation coefficients with total domain scores as criterion variables

Average Delta — Difficulty levels on a normalized range with a mean of 13.0 and a S.D. of 4.0

It is clear from the preliminary field test data in Table 1 that while there are some scales which require further refinement, the basic specifications of the Iowa Inventory appear reasonable. Data for each level are reported for all the students who completed the entire set of items in the scale or domain. As noted earlier, Book 1 included Interpersonal Relationships (IR), Occupational Knowledge (OC), Work Values and Attitudes (WV), and half of Self and Society (SS). Book 2 consisted of Self (SF), Decision Making Skills (DM), Economics (EC), and the second strand of Self and Society (SS). This is reflected in the fact that the sample size for each of the domains wholly contained in a single book is identical. The sample size for SS is the smallest in each level because it required that each student have completed both Inventory books and many students were absent on one of the two days during which the field test was administered in their classrooms.

The first indication that the Inventory appears to be working as expected in most domains is the average raw score. Economics, especially in the Awareness and Preparation levels, appears to the primary exception. In each of these two levels, the average raw score is much lower than for the other scales, and the reliability coefficients are unacceptably low. Preliminary evidence suggests that one reason for these values is that some of the content reflected in the Iowa Career Education Model objectives for economics may not be taught in most schools, especially in the early elementary and high school levels. Item analyses for questions focusing, for example, on the concept of "opportunity cost" indicate that many students who appear to do relatively well on the measure as a whole are guessing to these items.

Another key issue is represented in the average difficulties of each of the scales. The values reported are deltas, or a normalized distribution of item difficulties in which the mean is arbitratily set at 13 with a standard deviation of 4. These values typically range from 6 to 20. The average difficulty of the EC and OC scales is consistently the highest in each level, but it is at or above the mean value of 13 only for Economics across all four levels.

The Iowa Inventory field test data also confirm a tendency reported by school districts which participated in these administrations that third grade students appeared to have the most difficulty coping with the conceptual complexity and reading levels of the instruments. While this tendency is confirmed by the higher average delta values for the Awareness level, it also is clear that most students were able to complete the Iowa Inventory scales successfully, excluding Economics.

Further analyses of these preliminary field test data are summarized in Table 2. While some items are likely to be eliminated from the final inventory because item difficulty and discrimination indices indicate that they are performing poorly, the majority of the Iowa Inventory will remain in tact. Just 19 of 350 items in the field test edition, or just over five percent, appear to be performing poorly enough to warrant elimination.

Table 2

Field Test Items with Poor Difficulty and Discrimination Indices in the Iowa Career Education Inventory

Domain	Unique Items	Link Items
Self (SF)	None	1
Interpersonal Relationships (IR)	None	None
Self and Society (SS)	3	1
Decision Making Skills (DM)	1	None
Economics (EC)	2	3
Occupational Knowledge (OC)	3	3
Work Values and Attitudes (WV)	None	2
Total number of items:	9	10

Key: Criteria used to identify items were that P values (percent answering item correctly) were below chance level, or .25, or that biserial correlations were below .25. For link items, these criteria were applied to either of the two levels in which the items appeared in the Inventory.

Additional preliminary field test data are presented in Figures 6 through 12. These charts plot the difficulty or delta values of each item and show the relative changes in difficulty of each set of link items. They offer initial support for the underlying premise of the linking design--that items should be easier for the older population which is exposed to a particular set of link items. While analysis has not yet progressed to the stage of attempting to create continuous scales spanning grades 3-12 for the Iowa Inventory, the results presented in Figures 6 through 12 offer preliminary support for the finding that the concept is operationally feasible.

The final set of analyses completed as of this writing are illustrated in Figures 13 through 18. They are a sample of item bias comparisons based on plotting the deltas for each item for two groups within the field test sample. Three item bias contrasts were run for each level and domain of the Iowa Inventory, or a series of 84 separate graphs. The three item bias contrasts for each level and domain were: (1) male vs. female; (2) public vs. private school students; and (3) students in urban vs. rural counties.

The examples included in Figures 13-15 illustrate these item bias plots for all three comparisons of the Economics domain at the Awareness level. While item statistics indicate that some questions should be dropped from the Inventory, it is clear from these three analyses that none of the Awareness level items in the Economics domain are performing at substantially different levels of difficulty for these three pairs of contrasts. Figures 16-18 offer similar illustrations of single comparisons

for Economics at other levels in the Iowa Inventory. It should be noted that the Economics domain reflected some of the largest differences in difficulty levels for the Iowa Inventory, so it appears reasonable to conclude that the Inventory seems to be working comparably within and across each of these pairs of contrasting groups in the field test sample.

Recommendations

It is too early to conclude that continuous career development scales as proposed for the Iowa Career Education Inventory can be created in each of the seven domains separately. Further analysis of field test data will include examination of the impact of forming appropriate composite scores. For example, higher internal consistency reliability coefficients are likely if the OC and WV scales are combined into a single World of Work subscore, or if the three "affective" domains can be combined into a self-awareness composite. However, preliminary field test data clearly support further work to explore the appropriateness and interpretability of such scores.

If these measures can be linked across levels, an important next step may be to follow cohorts of students through the career development process represented in the Iowa Career Education Model and Inventory. Normative information and interpretative guides are to be developed in the spring of 1982 for use in Iowa, but there is little reason to believe that the domains and concepts reflected in the Iowa Inventory do not apply to similar efforts throughout the nation.

If such links are not successful, particularly in a domain which is not widely taught such as economics, further inquiry may be appropriate to identify barriers to their integration into classroom instruction. In addition, it is possible that some of the content and concepts in the Iowa Inventory are not continuous over time; if so, they should be examined carefully to help guide curriculum planners and counselors.

In any case, the Iowa Career Education Inventory should offer an additional resource with which to assess the appropriateness and effectiveness of integrating career education concepts into classroom instruction in grades 3-12.

References

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Fry, E. Graph for estimating readability--extended. New Brunswick, NJ: Rutgers University Reading Center, 1977.

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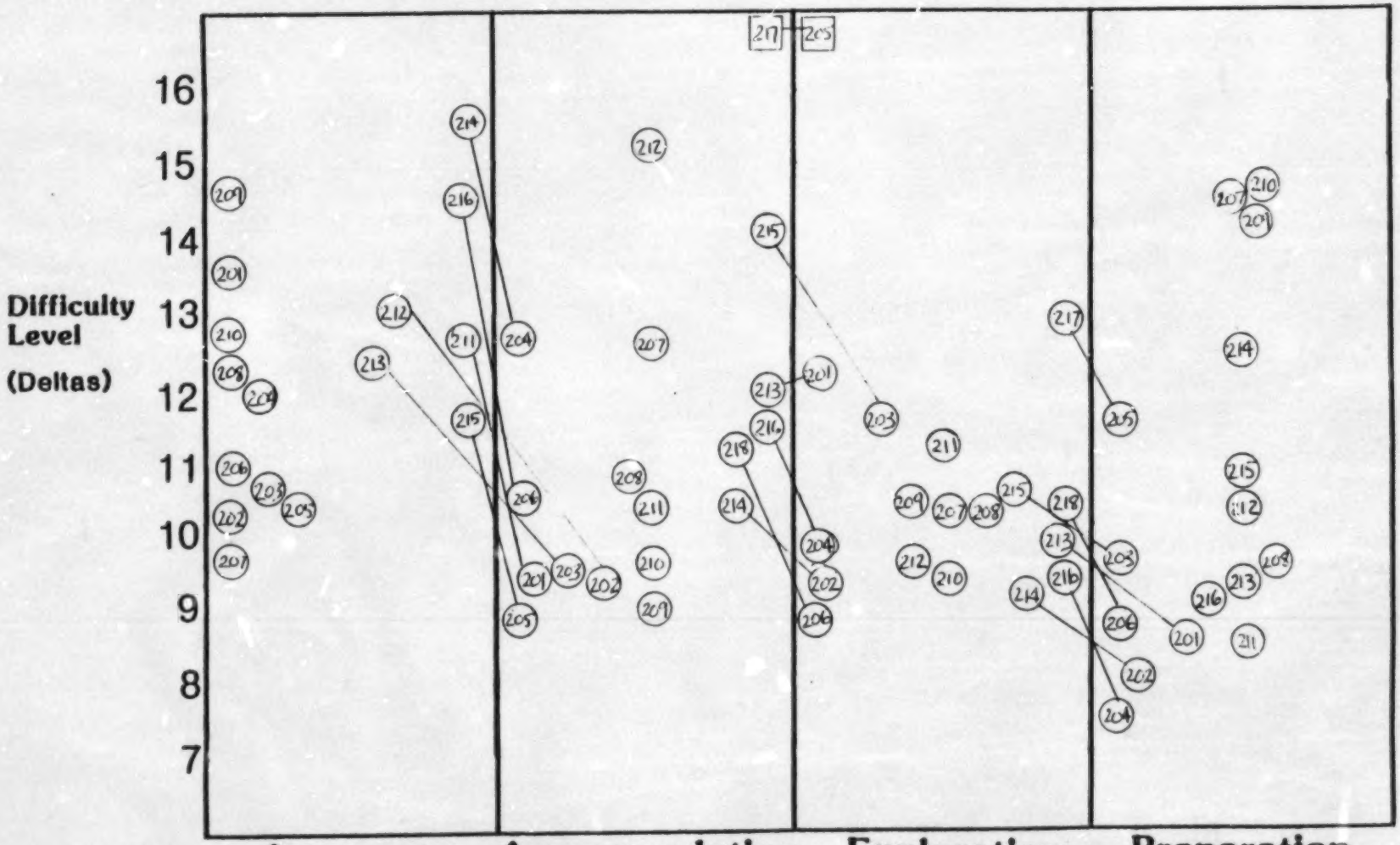
Iowa Department of Public Instruction. Models for career education in Iowa. Des Moines: Iowa DPI, 1973.

Figure 6

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

SELF



KEY: (1) item number
(2)–(3) link items

Figure 7

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

INTERPERSONAL RELATIONSHIPS

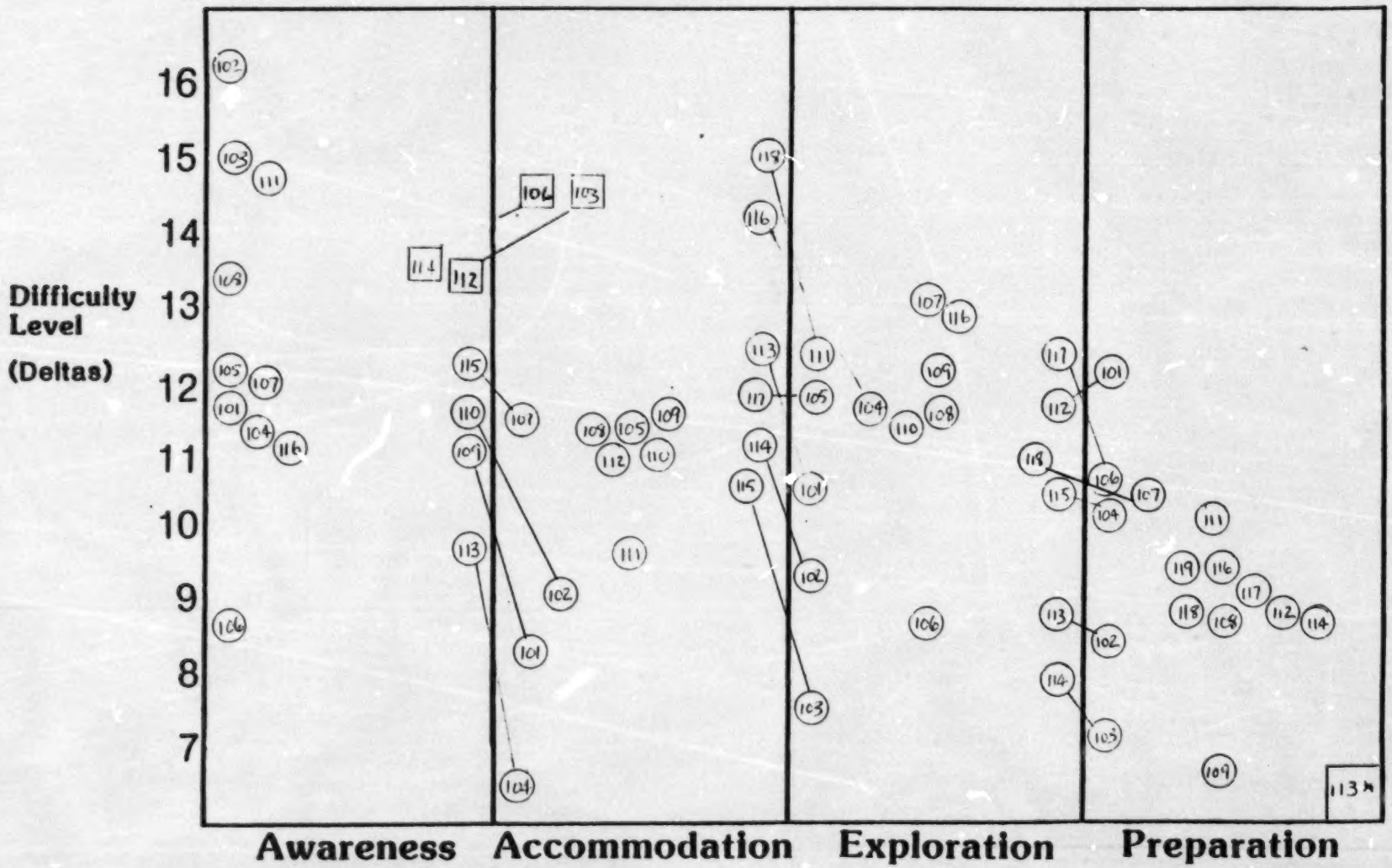


Figure 8

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

SELF AND SOCIETY

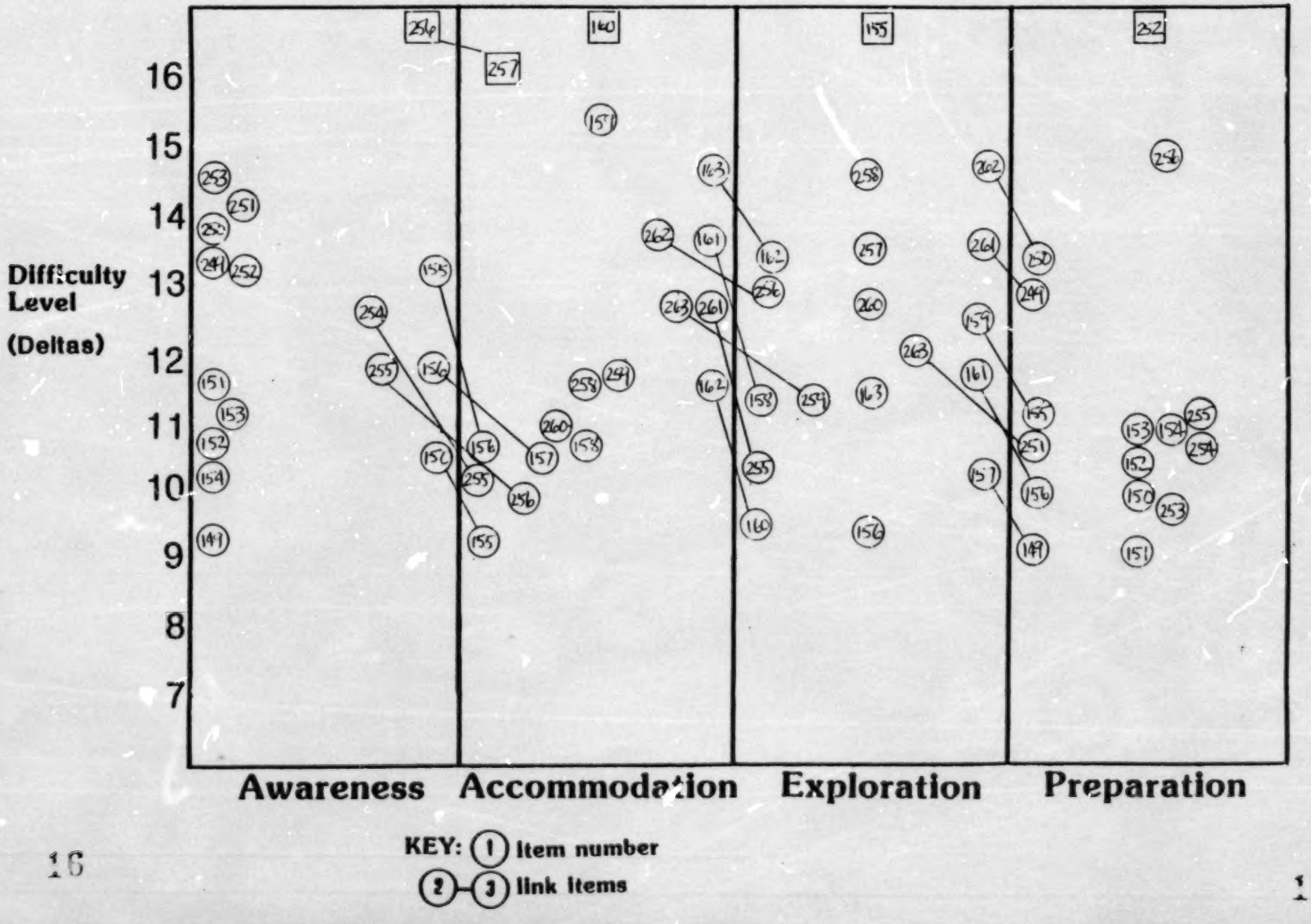


Figure 9

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

DECISION MAKING

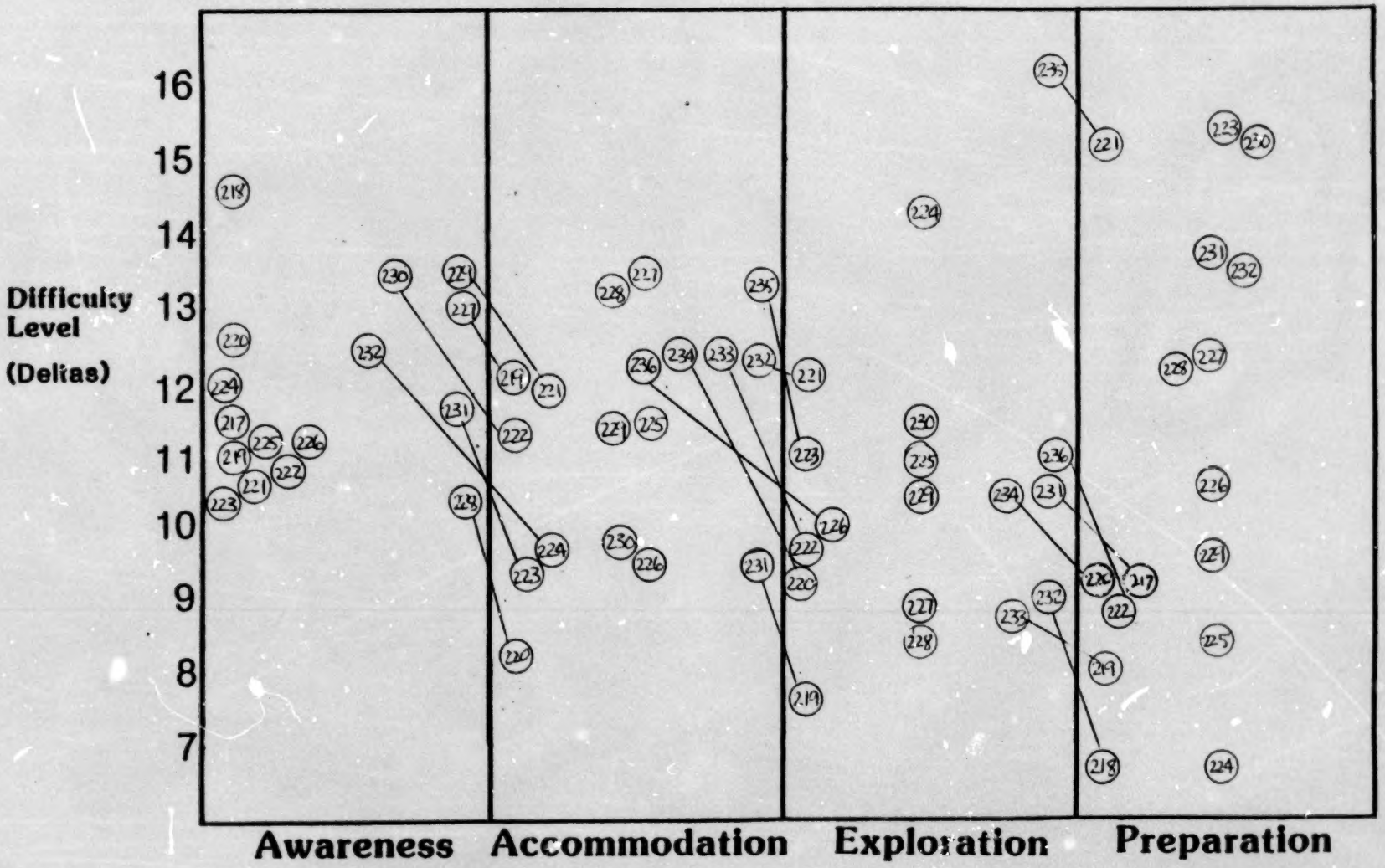


Figure 10

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

ECONOMICS

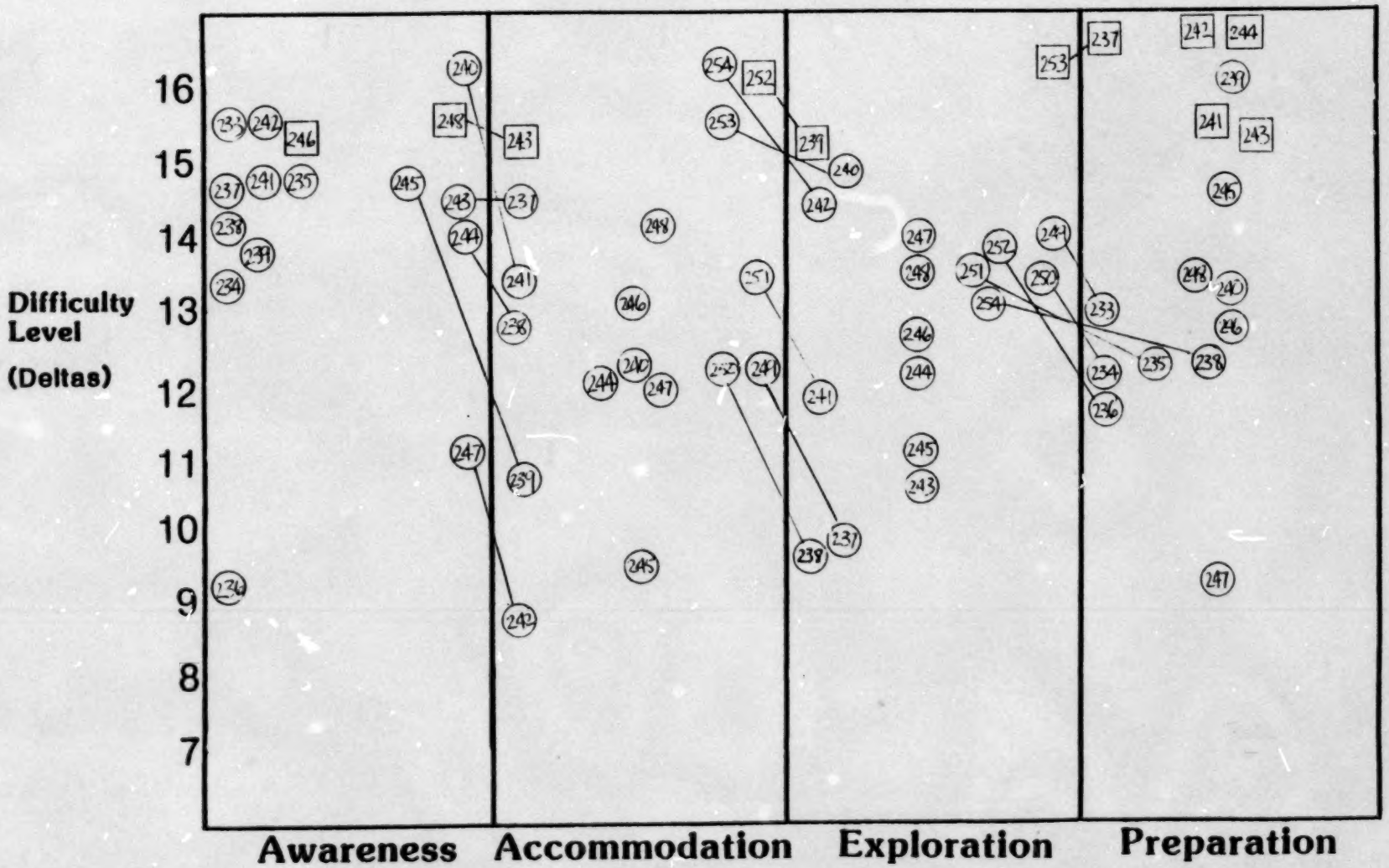


Figure 11

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

OCCUPATIONAL KNOWLEDGE

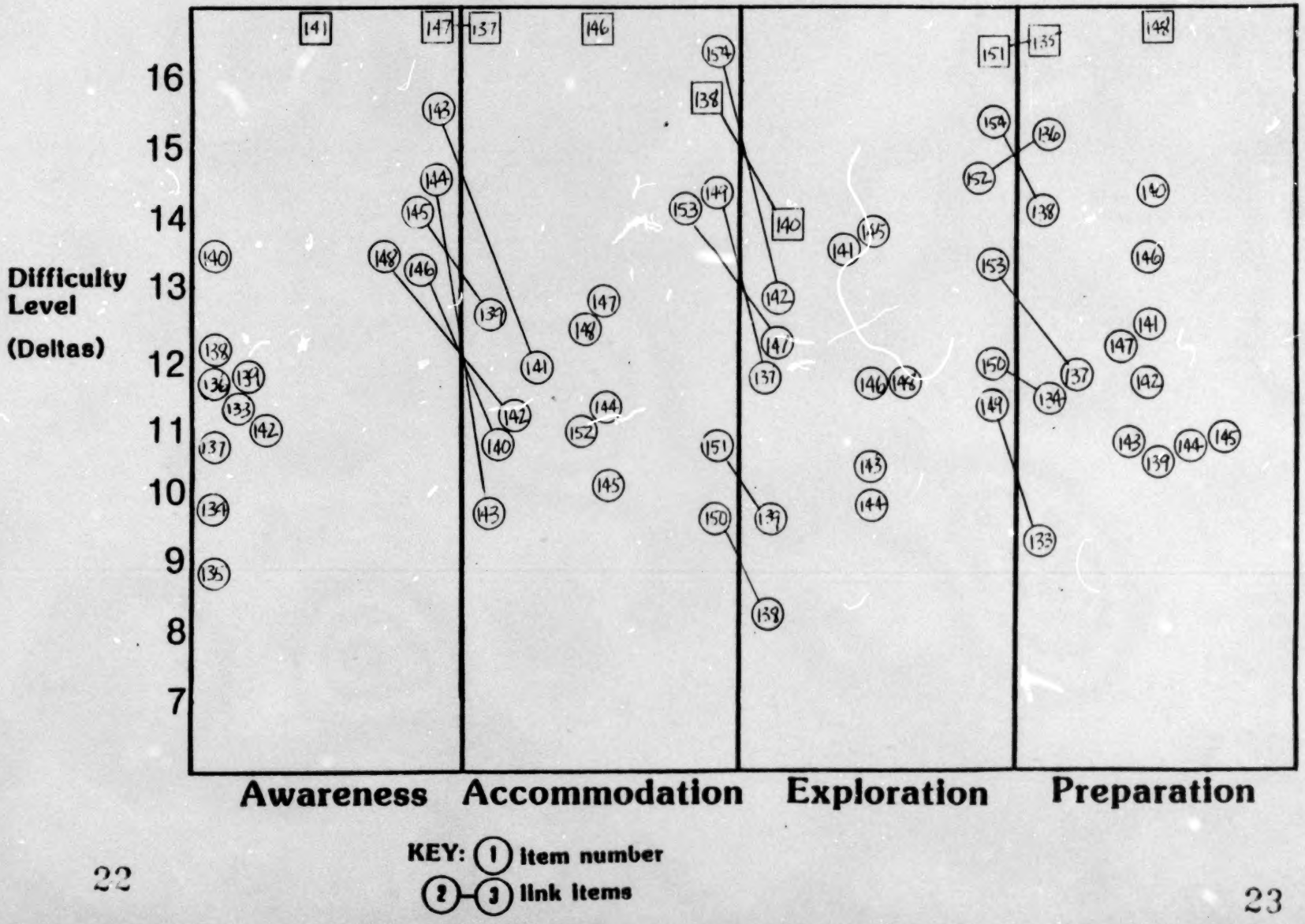


Figure 12

IOWA CAREER EDUCATION INVENTORY
FIELD TEST RESULTS

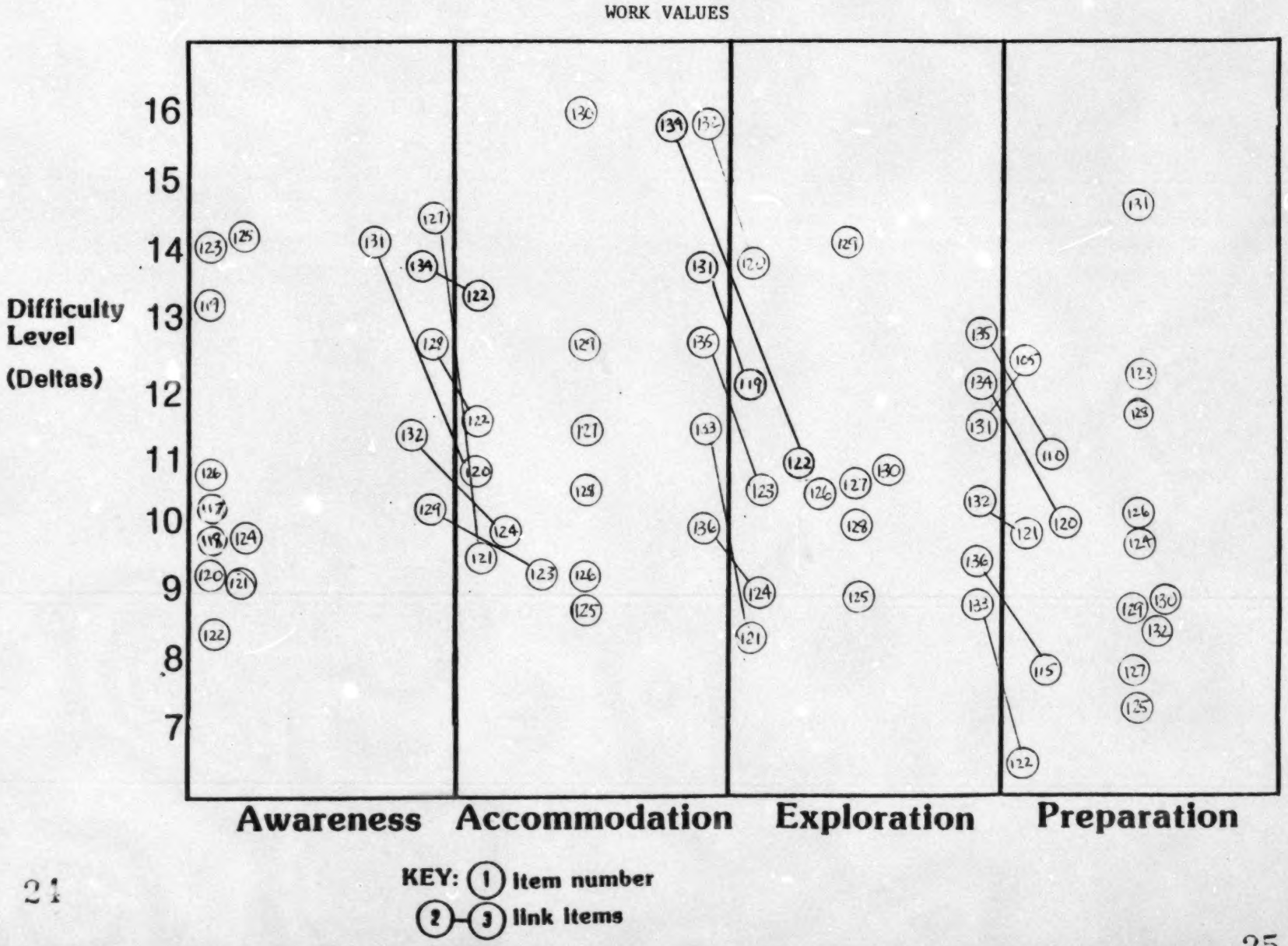


Figure 13

DELTAS

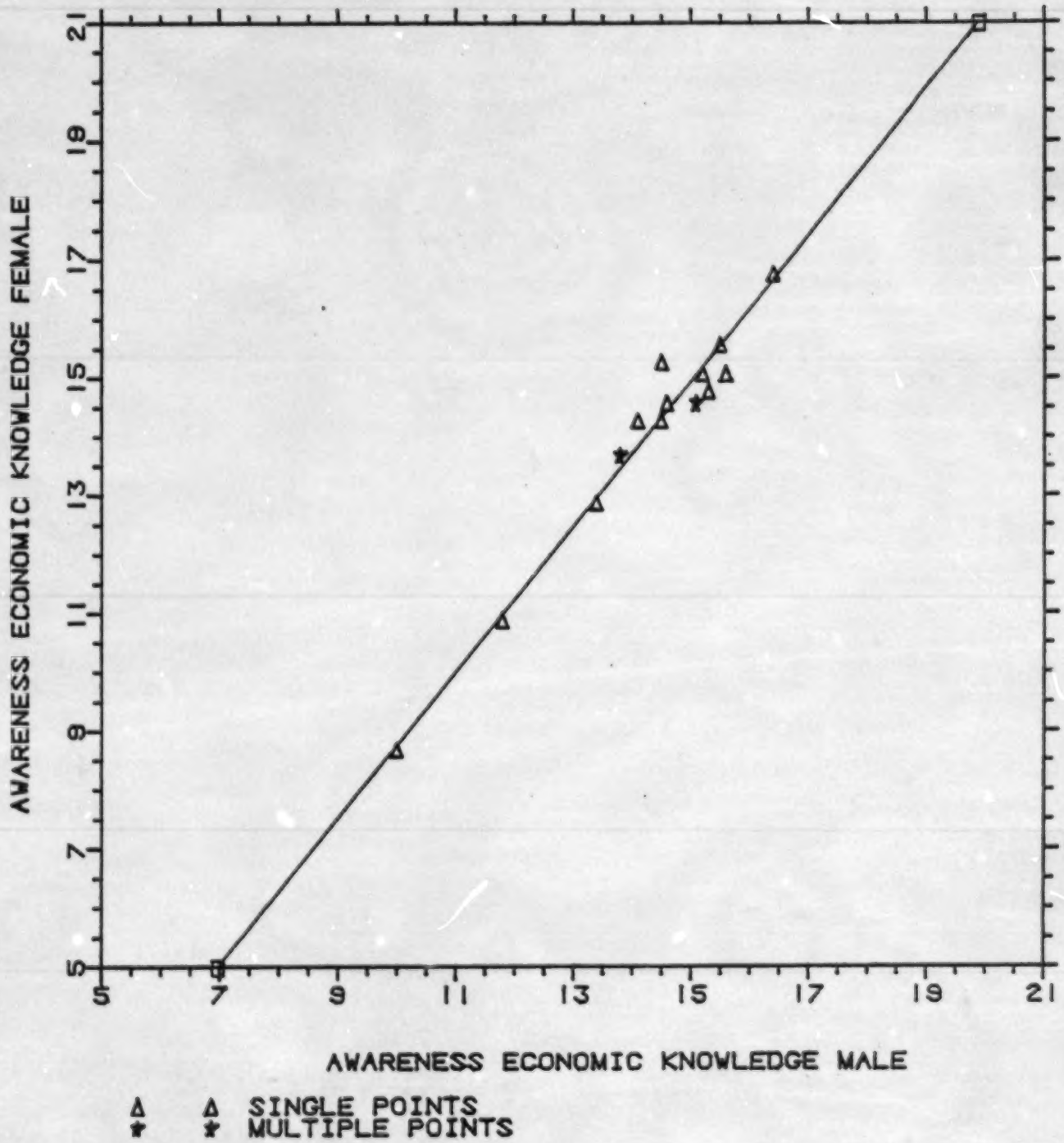
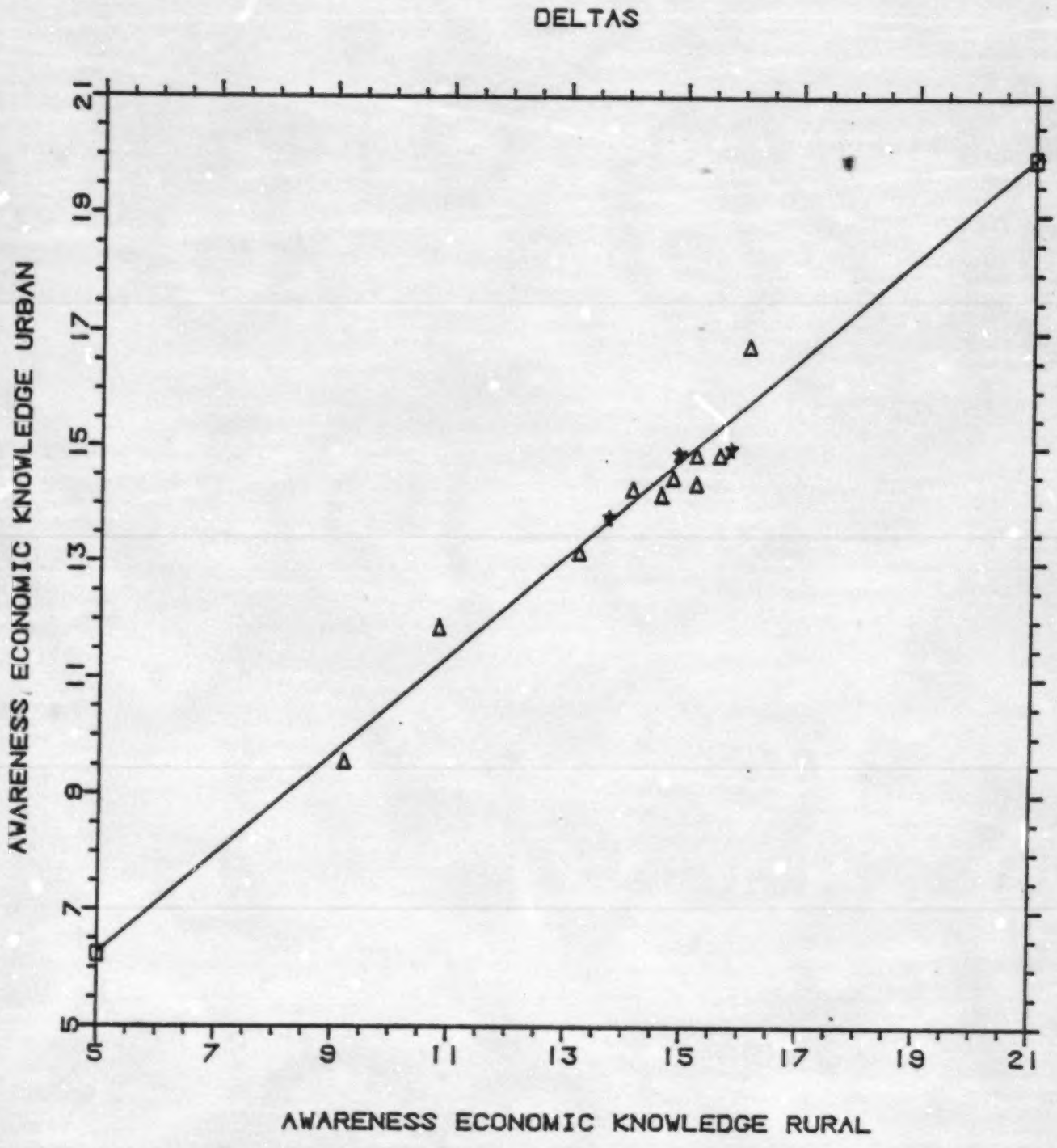


Figure 14


DELTAS
AWARENESS ECONOMIC KNOWLEDGE URBAN
AWARENESS ECONOMIC KNOWLEDGE RURAL
5
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SINGLE POINTS
MULTIPLE POINTS

Figure 15

Deltas

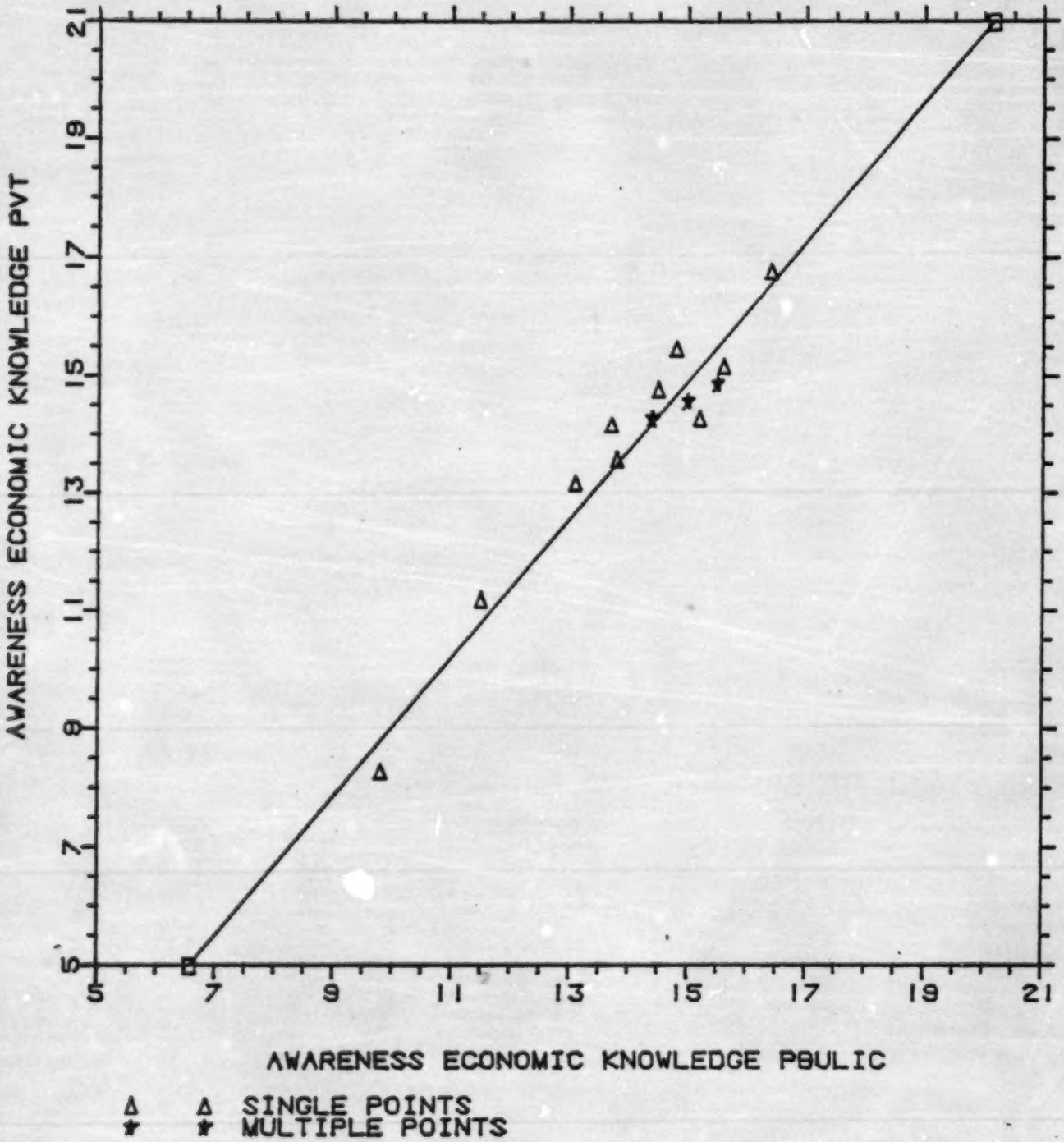


Figure 16

DELTAS

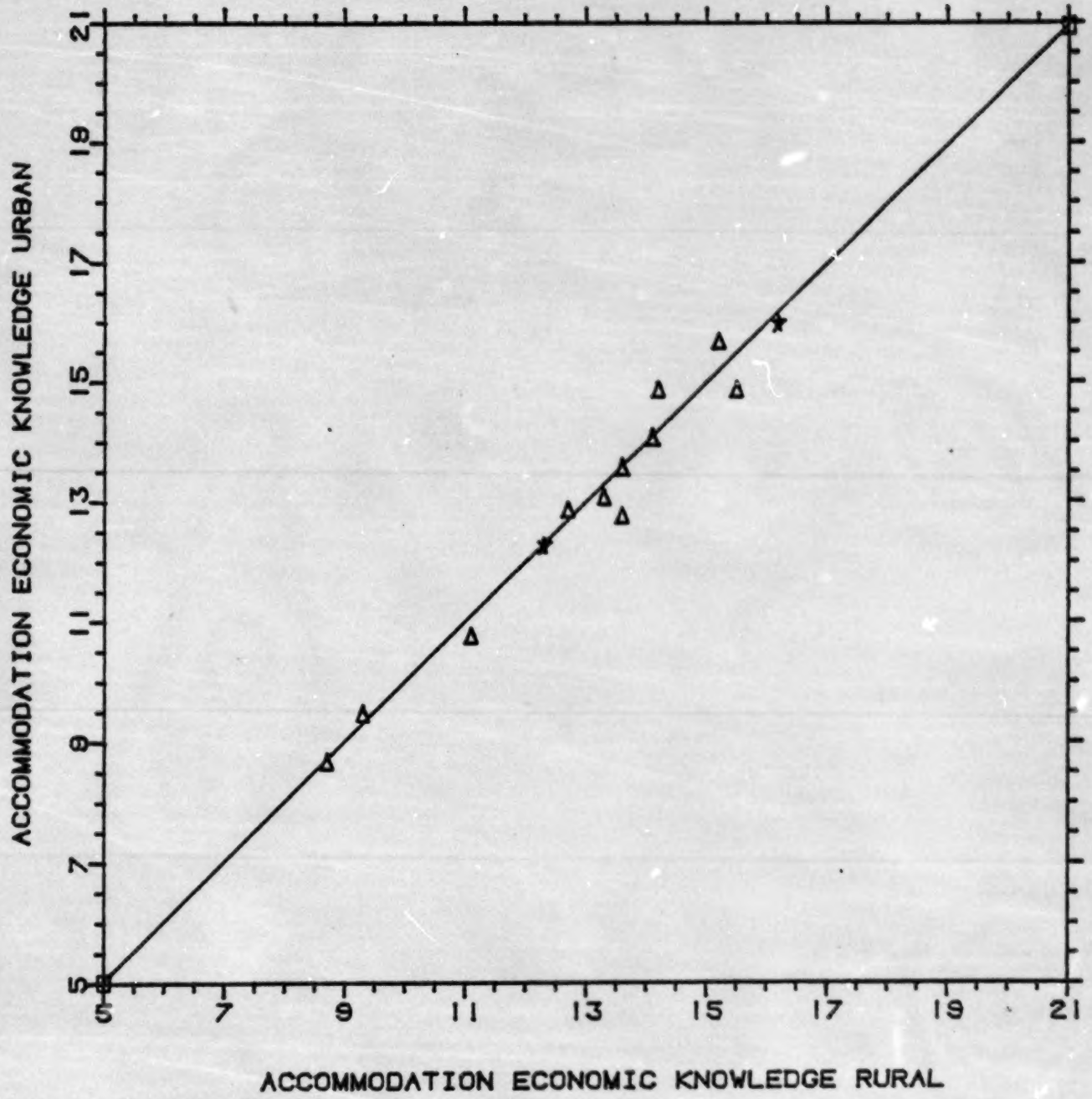
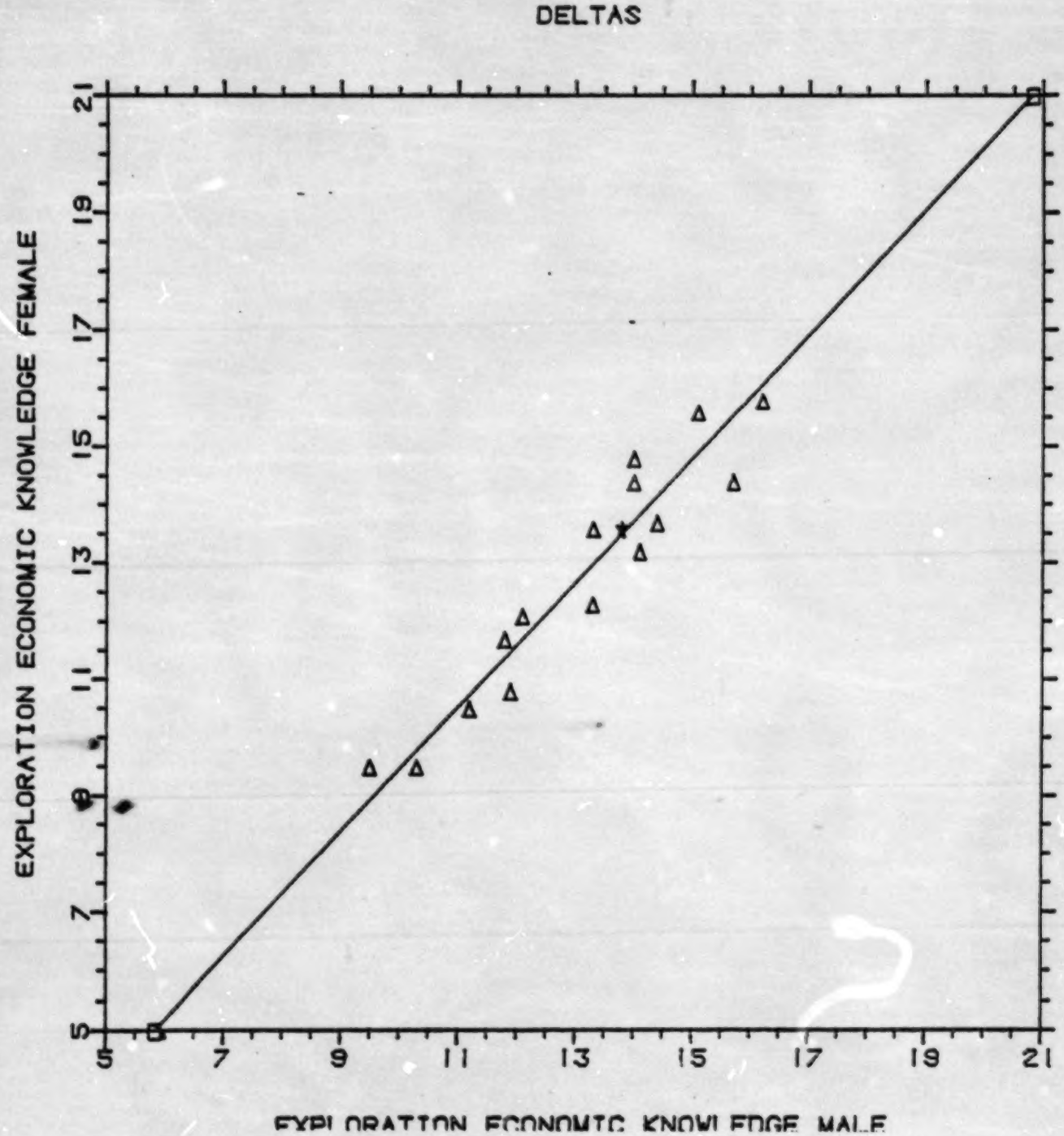


Figure 17


DELTAS
EXPLORATION ECONOMIC KNOWLEDGE FEMALE
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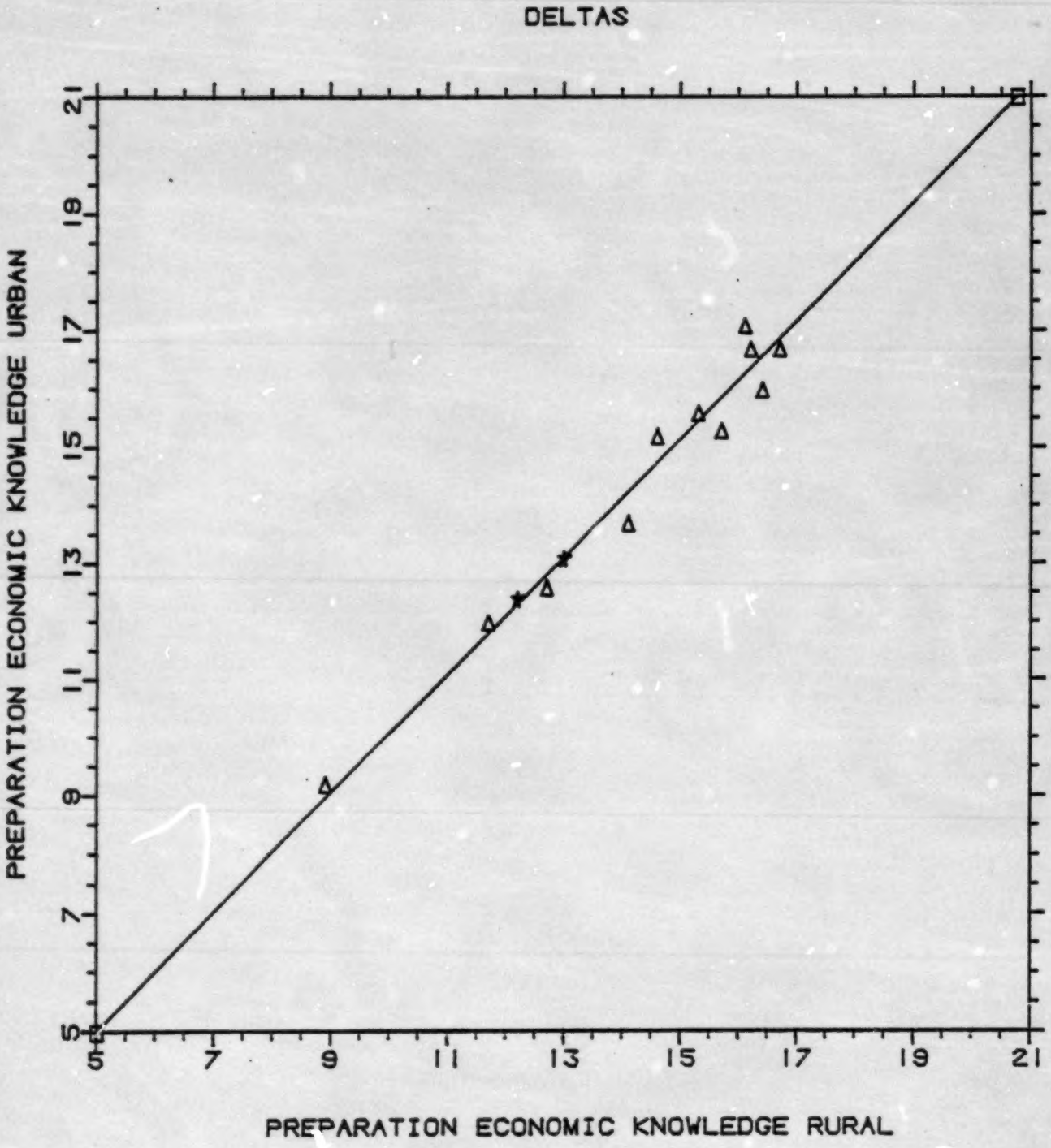
EXPLORATION ECONOMIC KNOWLEDGE MALE

Figure 18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PREPARATION ECONOMIC KNOWLEDGE RURAL
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